(a)

PATENT ABSTRACTS OF JAPAN

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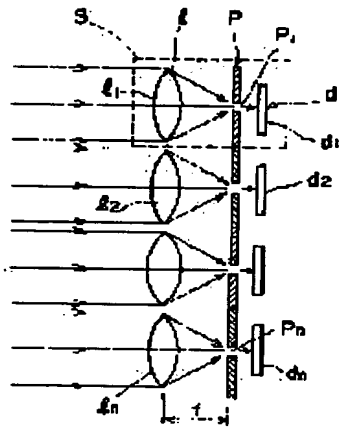
(54) IMAGE SENSOR

(57)Abstract:
PURPOSE: To provide a small-sized image sensor system which requires no large image forming lens.
CONSTITUTION: The small-sized, inexpensive image sensor which requires no large-diameter image forming lens is constituted by arraying plural unit element systems S each consisting of three elements, i.e., a unit photodetecting element (d), a lens corresponding to the unit photodetecting element (d), and a pinhole P which is provided between unit photodetecting elements (d) and nearby the focal length (f) of the lens and has a much smaller aperture than the aperture diameter of the lens.



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of positioning for two or more lenses to form a lens on the same substrate. It is carried out by alignment of a lens and a pinhole bundling up by moreover contacting and establishing a pinhole in **** of a substrate which prepared two or more lenses, and also is effective in being strong to an impact etc. Furthermore, when an infrared cut filter was prepared between an unit photo detector and a lens or on a lens side, it was effective in disturbance light removal again.
[0009]
[Function] In drawing 10 which shows the principle of a spatial filter, directivity is [the magnitude of a pinhole] more effective still, so that it is small. However, it is not necessary to carry out to below the diffraction limit of light. Moreover, as for the location of a pinhole, putting on the focal location of a lens is most effective.
[0010] However, although the light A spread in accordance with the optical axis which a pinhole and a lens form will pass through a pinhole if the pinhole which has a sufficiently small opening compared with a lens diameter is prepared near the focal location of a lens and a lens as shown in drawing 10 , the light B which crosses an optical axis is shaded. Therefore, only the light which faces to a lens near the optical axis can detect the reinforcement. Consequently, two or more optical system as shown in drawing 10 is arranged in juxtaposition, and the scattered-light intensity distribution of space can be detected by turning each optical axis in the direction of arbitration.
[0011] For example, in the **** image-sensors system shown in drawing 8 , by the optical system by the combination of Lens In and Pinhole Pn of the field of a2, the scattered-light reinforcement of the field of an is detected, respectively, and by doubling them shows the scattered-light reinforcement of space at the optical system by the combination of a lens I1 and a pinhole P1 according to the optical system by the combination of the lens I2 and pinhole P2 of the field of a1 of Image A. Thereby, a shape recognition etc. can be performed like the conventional image sensors.
[0012] In addition, a photo detector does not necessarily need to correspond one [at a time], for example, two or more small pixels like CCD may correspond. Moreover, you may make it form one photo detectors d, such as CCD which can detect the intensity distribution on a photo detector side as shown in drawing 8 , and an electronic formula image pipe, to all optical system.
[0013]
[Example] Hereafter, the example of this invention is explained with reference to a drawing.
[0014]
[Example 1] This example explains invention of claim 1 of this invention concretely. In drawing 1 , two or more arrays are carried out and the unit photo detector 5 which consists of a pinhole P which has a sufficiently small opening compared with the diameter of the lens I prepared in the focal location of Lens I and Lens I, and an unit photo detector d constitutes image sensors. Lens I may be a diffraction mold lens like a gradient index lens and a micro Fresnel lens besides the usual convex lens. Pinhole P may punch a metal plate by etching, may carry out the mask vacuum evaporationo of the metal etc. at a glass plate, or may form it by which method. In addition, constituting on the same plane, respectively can perform assembly easily, and each lenses I1-In, Pinholes P1-Pn, and photo detectors d1-dn have it because of exact image formation formation. [advantageous]
[0015]
[Example 2] This example explains the desirable embodiment of claim 4 of this invention, and shows that outline to drawing 2 . In this example, it is the feature that the opticals axis x1-xn of an unit photo detector are not parallel. If it puts in another way, the gap of the optical-axis center to center of each lens I and the gap of the corresponding pinhole P are not in agreement. Regardless of the magnitude of image sensors, the effect which can select the magnitude of object space is produced by consisting of such arrangement.
[0016]
[Example 3] This example explains the desirable embodiment of claim 5 of this invention, and as shown in drawing 3 , it constitutes Lens I on the same lens substrate LB. Two or more lens I1 -In (s) in this example Special positioning is unnecessary and it has the feature which can be formed at once. Substrate LB can use plastic sheets, such as a glass plate, an acrylic board, and a

polycarbonate board. Lens I can be formed by the Mitsuteru injection molding method by ultraviolet-rays hardenability resin, an injection-molding method, an ion diffusion method, etc.
[0017]
[Example 4] This example is formed in the structure which contacted and established Pinholes P1-Pn in the rear face of a substrate in which two or more lenses I1-In were formed, as the desirable embodiment of claim 6 of this invention is explained and is shown in drawing 4 . In order to converge light on the pinhole section P, thickness of Substrate LB is made almost equal to the focal distance f of Lens I. Pinhole P may paste up a pinhole board on the lens substrate LB, or may form it by vacuum evaporationo etc. By making it such a configuration, it is carried out by the alignment of Lens I and Pinhole P bundling up, and also has the effect of being strong, to an impact etc.
[0018]
[Example 5] This example explains the desirable embodiment of claim 8 of this invention, and as shown in drawing 5 , the feature is in the configuration formed in the substrate with which the photo detector d is formed in Lens I and Pinhole P by carrying out fixed unification. If the gap of a photo detector side and a pinhole is not larger than the focal distance f of a lens, it is good.
[0019]
[Example 6] This example invents the desirable embodiment of claim 9 of this invention, and as shown in drawing 6 , the feature is in the structure which formed the infrared cut layer R for disturbance light removal. The example which constituted the multilayered film R for an infrared cut [on the lens substrate LB which formed Pinhole P] with vacuum deposition from this example is illustrated.
[0020]
[Example 7] As the 2nd invention indicated by claim 2 of this application be explained and it be shown in drawing 7 , namely, S1-Sn be prepared on one photo detector d, and this example constitute image sensors. [the unit spatial filter system S which consist of pinholes which have a sufficiently small opening compared with the opening diameter of the lens prepared near focal distance f of one Lens I and Lens I] Thus, even if it forms one photo detectors d, such as CCD which can detect the intensity distribution on a photo detector side, and the electronic formula camera tube, to all optical system, the same effect as the 1st invention is acquired.
[0021]
[Effect of the Invention] As explained above, according to this invention, a small and cheap image-sensors system with the unnecessary image formation lens of the expensive diameter of macrostomia can be offered by preparing two or more unit spatial filters which put in order two or more unit light-receiving systems which make a photo detector, a lens, and a pinhole 1 set, or make a lens and a pinhole 1 set on photo detectors, such as an electron tube type image sensor and CCD.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is explanatory drawing of the example 1 of the image sensors which this invention requires.
[Drawing 2] It is explanatory drawing of the example 2 of this invention.
[Drawing 3] It is explanatory drawing of the example 3 of this invention.
[Drawing 4] It is explanatory drawing of the example 4 of this invention.
[Drawing 5] It is explanatory drawing of the example 5 of this invention.
[Drawing 6] It is explanatory drawing of the example 6 of this invention.
[Drawing 7] It is explanatory drawing of the example 7 of this invention.
[Drawing 8] It is explanatory drawing of an image formation operation of the image sensors concerning this invention.
[Drawing 9] It is explanatory drawing of an image formation operation of the conventional image sensors.
[Drawing 10] It is explanatory drawing of the principle of a spatial filter.
[Description of Notations]
d Unit photo detector
f Focal distance
l Lens
P Pinhole
S Unit light-receiving system

[Translation done.]

(a)

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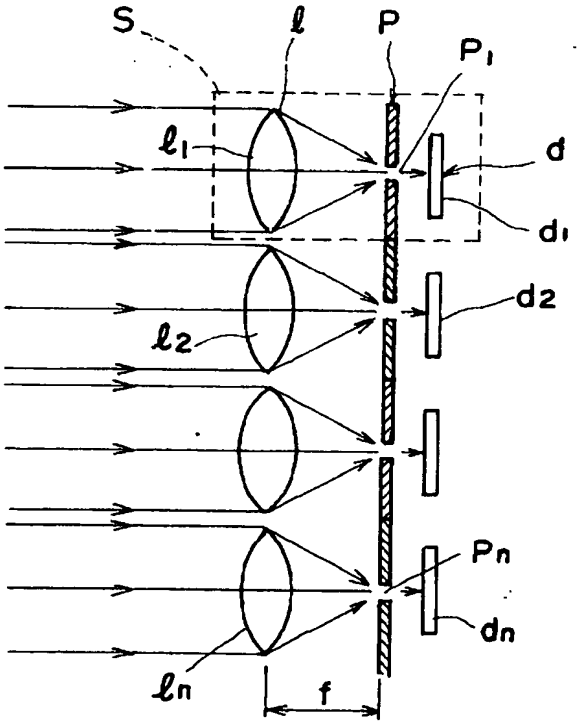
(54)【発明の名称】　イメージセンサ

(57)【要約】
【目的】　大きな結像レンズの不要な小型のイメージセンサ系を得る。
【構成】　単位受光素子ｄと、この単位受光素子ｄの各々と対応した１個のレンズｌと、このレンズｌと単位受光素子ｄの間にあってレンズｌの焦点距離ｆ付近に設けられたレンズｌの開口直径に比べて十分小さい開口を有するピンホールＰとの３種の素子を１組とする単位素子系Ｓを複数配列することによって、大口径の結像レンズを必要としない小型、低廉なイメージセンサを実現できる。



ター系Ｓが複数個、すなわちS_1～S_nが１個の受光素子ｄ上に設けられてイメージセンサを構成している。このように受光素子面上での強度分布が検出できるＣＣＤ、電子式撮像管などの受光素子ｄをすべての光学系に対して１つ設けるようにしても第１の発明と同様の効果が得られる。

【００２１】

【発明の効果】以上説明したように本発明によれば、受光素子とレンズとピンホールを１組とする単位受光系を複数並べるか、あるいはレンズとピンホールを１組とする単位空間フィルターを複数個電子管式撮像素子やＣＣＤ等の受光素子上に設けることによって、高価な大口径の結像レンズが不要な、小型で安価なイメージセンサ系を提供することができる。

【図面の簡単な説明】

【図１】本発明の係るイメージセンサの実施例１の説明図である。

【図２】本発明の実施例２の説明図である。

【図３】本発明の実施例３の説明図である。

【図４】本発明の実施例４の説明図である。

【図５】本発明の実施例５の説明図である。

【図６】本発明の実施例６の説明図である。

【図７】本発明の実施例７の説明図である。

【図８】本発明に係るイメージセンサの結像作用の説明図である。

【図９】従来のイメージセンサの結像作用の説明図である。

【図１０】空間フィルターの原理の説明図である。

【符号の説明】

ｄ　単位受光素子

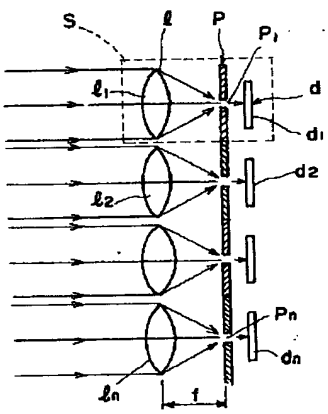
ｆ　焦点距離

ｌ　レンズ

Ｐ　ピンホール

Ｓ　単位受光系

【図１】



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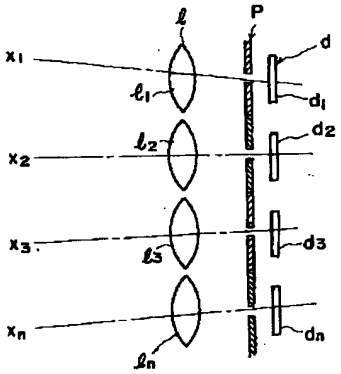

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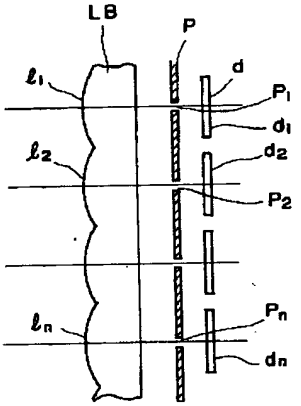

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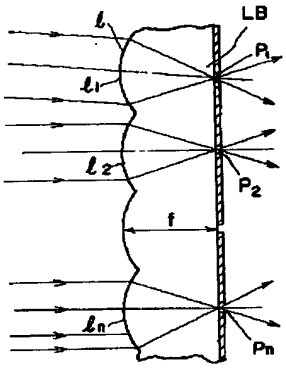
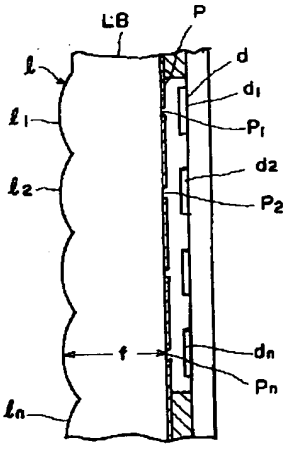


【図５】



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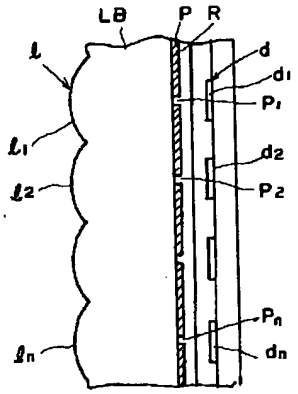
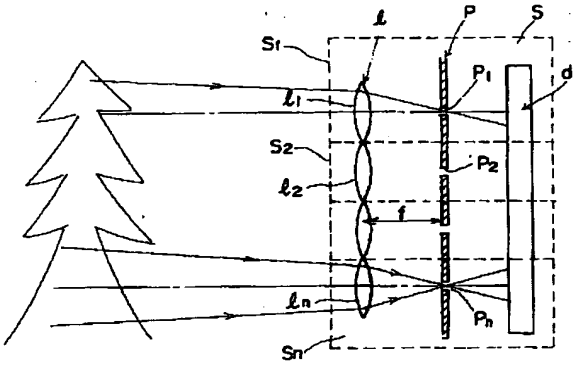


【図７】



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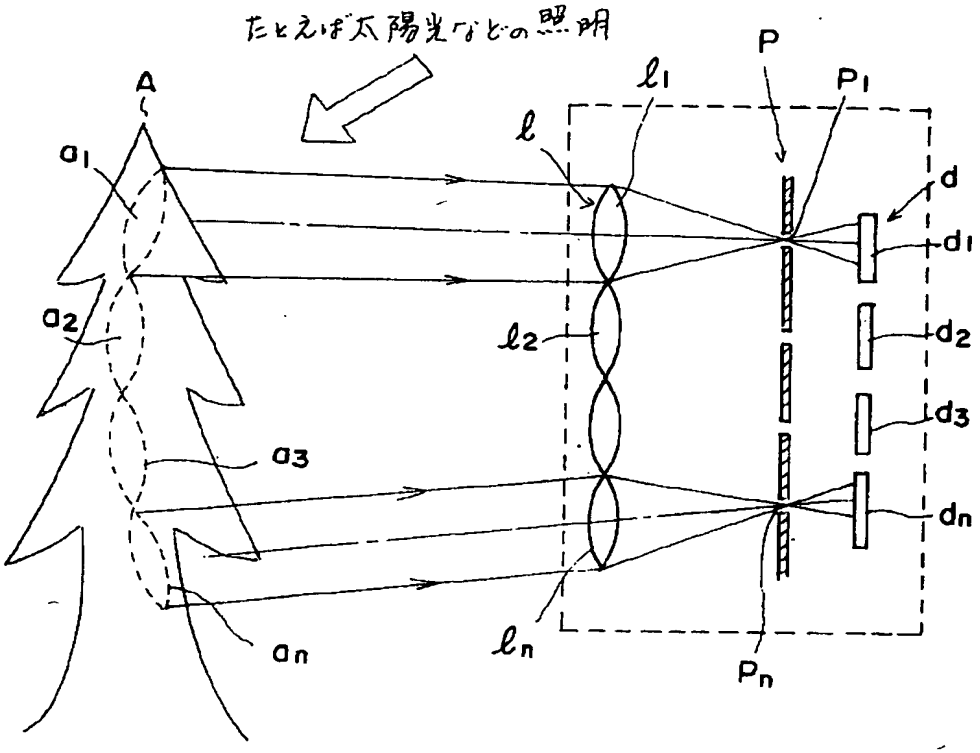
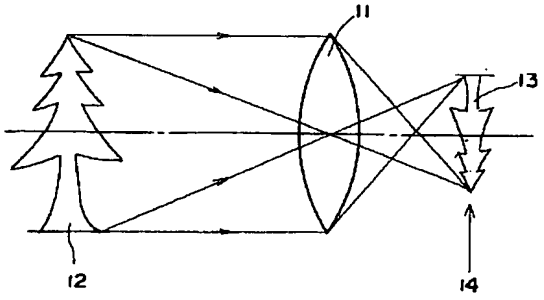
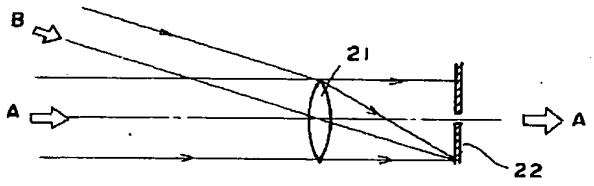

たとえば太陽光などの照明
A
a1
a2
a3
an
l
l1
l2
ln
P
P1
Pn
d
d1
d2
d3
dn

【図９】


11
12
13
14

【図１０】


B
A
21
A
22